

WHAT IS CLAIMED IS:

1. A switch for routing information to one of a first and second outputs, respectively, comprising:

first and second multi-rail control paths;

5 first and second mutex gates, said first and second multi-rail control paths being cross connected into said first and second gates;

first and second demultiplexers, outputs of said first and second mutex gates being cross connected into said first and second demultiplexers; and

first and second data paths input to said first and second demultiplexers, respectively;

10 wherein data on at least one said first and second data paths is routed to one of said first and second outputs based upon a state of said outputs of said first and second mutex gates.

15 2. The switch of claim 1, wherein when said first and second multi-rail control paths have substantially simultaneously pending signals requesting to route data on said first and second data paths to different outputs, then said signals are simultaneously routed without collision.

20 3. The switch of claim 1, wherein when said first and second multi-rail control paths collide by substantially simultaneously receiving signals requesting to route data on said first and second data paths to an identical output of said first and second outputs, then data on one of the first and second signal paths randomly passes to said identical output before data on the other of said first and second data paths.

25 4. The switch of claim 1, wherein when said first and second multi-rail control paths have substantially simultaneously pending signals requesting to route data on said first and second data paths to an identical output of said first and second outputs, then data associated with the first to arrive of the first and second control paths passes to said identical output before data associated with the last to arrive of said first and second control paths.

5. The switch of claim 1, further comprising:

a data stream on said first data path, said data stream including information and a routing address corresponding to a desired one of said first and second outputs; and

an extractor capable of routing said routing address to said first multi-rail input, and

5 routing said information to said first data path.

6. The switch of claim 1, wherein said first and second data paths are multi-rail paths.

10 7. The switch of claim 1, further comprising:

a downstream circuit capable of generating a first acknowledge signal responsive to data on said first data path reaching said downstream circuit.

8. A switch for routing information to one of n outputs, comprising:

15 first and second n-rail control inputs;

n mutex gates, each  $j^{\text{th}}$  path of said first and second n rail control inputs being connected into each jth one of said n mutex gates;

first and second demultiplexers, outputs of said n mutex gates being cross connected to said first and second demultiplexers; and

20 first and second data paths input to said first and second demultiplexers, respectively;

wherein data on at least one said first and second data paths is routed to one of said n outputs based upon a state of said outputs of said n mutex gates.

25 9. The switch of claim 8, wherein said first and second data paths are multi-rail paths.

10. The switch of claim 8, further comprising:

a first extractor having a data stream input, an information output, and a routing address output;

30 said data stream input being connected to an upstream circuit;

said information output being connected to said first data path; and

said routing address output being connected to said first n-rail control paths.

11. The switch of claim 8, wherein said first extractor is capable of separating information and a routing address from an incoming data stream.

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12. The switch of claim 10, wherein a state of said control data output remains unchanged until said extractor receives an acknowledge signal, said acknowledge signal representing that information on said information output has reached a desired destination.

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13. The switch of claim 1, further comprising first, second, third, and fourth switches, the outputs of said first and second switches being cross connected with the inputs of said third and fourth switches.

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14. The switch of claim 1, wherein said switch does not receive a clocked signal.

15. A method for routing signals through a switch, the method comprising:

receiving a plurality of data streams;

detecting, in each data stream, a routing address representing a request to pass that data stream to a desired destination;

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routing each data stream consistent with the respective routing address in the order received;

routing at least two of the data streams to different destinations substantially simultaneously when the at least two data streams are substantially simultaneously received and the respective desired destinations are different; and

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routing, when the at least two data streams are substantially simultaneously received and the respective desired destinations are identical, one of the at least two data streams to the identical destination followed by sending another of the at least two signals to the identical destination.

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16. The method of claim 15, wherein the first and second requests are multi-rail signals, and said receiving comprises receiving the multi-rail signals.

17. The method of claim 15, further comprising separating the routing address from the one of the at least two data streams.

5           18. The method of claim 17, further comprising separating the routing address from the another of the at least two data streams.

19. A method for routing signals through a switching network, the method comprising:

10           providing a plurality of stages, each stage including at least two switches;  
            cross connecting the outputs of switches in an upstream one of said stages with inputs to switches in an adjacent downstream one of said stages; and

            each switch:

                receiving a plurality of asynchronous data streams;

15           detecting, in each data stream, a routing address representing a request to pass that data stream to a desired destination;

            routing each data stream consistent with the respective routing address in the order received;

20           routing at least two of the data streams to different destinations substantially simultaneously when the at least two data streams are substantially simultaneously received and the respective desired destinations are different; and

25           routing, when the at least two data streams are substantially simultaneously received and the respective desired destinations are identical, one of the at least two data streams to the identical destination followed by sending another of the at least two signals to the identical destination.

20. The method of claim 19, wherein each switch has two inputs and two outputs to define a two by two switch, and said providing comprises providing two stages, each stage including two switches, to define a four by four-switching network.

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21. The method of claim 19, wherein each switch has two inputs and two outputs to define a two by two switch, and said providing comprises providing three stages, each stage including four switches, to define an eight by eight-switching network.

5           22. The method of claim 19, further comprising sending an acknowledge signal upstream to confirm that a data stream has reached a desired location.